Claims

1. A magnetically tagged article, the article bearing a spatial distribution of passive magnetic elements, each such magnetic element comprising a layer of soft magnetic material characterised by high permeability, low coercivity and a non-linear B-H characteristic, and formed as a discrete region of such material, and each such magnetic element having at least one second layer of magnetic material capable of being permanently magnetised at least in a region adjacent said first layer to provide a magnetic bias for the said magnetic element; the bias of individual said magnetic elements in said spatial distribution and the particular spatial nature of the said distribution for the said article enabling the said article to be magnetically encoded.

2. An article comprising a magnetic tag or marker adapted to be attached to a selected article to be tagged, and comprising a substrate, preferably flexible, the substrate carrying a spatial distribution of passive magnetic elements, each such magnetic element comprising a layer of soft magnetic material characterised by high permeability, low coercivity and a non-linear B-H characteristic, and formed as a discrete region of such material, and each such magnetic element having associated therewith at least one second layer of magnetic material capable of being permanently magnetised at least in a region adjacent said first layer to provide a magnetic bias for the said magnetic element; the bias of individual said magnetic elements in said spatial distribution and the particular spatial nature of the said distribution for the said tag or marker enabling the article to be tagged to be magnetically encoded.

3. An article according to Claim 1 or Claim 2, wherein the spatial distribution is in two dimensions.

4. An article according to Claim 1, wherein the article includes a curved surface circumextending about an axis, and the magnetic elements are distributed on

said surface at locations spaced in the circumferential direction relative to the said axis.

5. An article according to any preceding Claim, wherein a single continuous second layer is common to all said magnetic elements, the spatial distribution of the discrete regions of said soft magnetic material defining the spatial distribution of said magnetic elements.

6. An article according to both Claim 2 and Claim 5, wherein said continuous second layer serves as said substrate.

7. An article according to any of Claims 1 to 4, wherein each said magnetic element has at least two said second layers characterised by differing coercivities, whereby said second layers are arranged to provide plural levels of bias to a single said magnetic element.

8. An article according to any preceding Claim, wherein said first layer has an extrinsic relative permeability greater than 10^3 and a coercivity of not more than 10 A/m.

9. An article according to Claim 8, wherein the first layer is in the form of a thin film.

10. A system comprising at least one article according to any preceding Claim and a reading assembly therefor, the reading assembly comprising means adapted to apply a magnetic bias signal that varies over time to a said magnetic element and means adapted to detect when the said bias signal approximates the said magnetic bias provided by the second layer, thereby enabling the level of the said magnetic bias to be determined.

11. A system according to Claim 10, wherein the reading assembly comprises a spatial array of reading sub-assemblies, each such sub-assembly being

adapted for localised reading, whereby in reading a said article, each such sub-assembly is arranged to read an associated magnetic element while being substantially insensitive to other magnetic elements of the spatial distribution.

12. A system according to Claim 11, wherein the distribution of sub-assemblies in said array corresponds to the said spatial distribution of magnetic elements.

13. A system according to Claim 11, wherein the number of sub-assemblies in said array exceeds the number of magnetic elements in said spatial distribution, whereby in reading a said article, each magnetic element in said spatial distribution is arranged to produce a signal in at least one sub-assembly, so that the reading assembly and the article do not require exact registration with each other.

14. A system adapted for registration of a first article with a second article, comprising a system according to Claim 12, wherein the first article comprises the reading assembly and the second article comprises a said at least one article.

15. A system according to any of Claims 10 to 14, wherein the detect means comprises a loop substantially of figure-of-eight form adapted to detect a signal produced when the variable bias signal approximates the magnetic bias provided by the second layer of a said magnetic element.

16. A system according to any of Claims 10 to 15, wherein said magnetic bias signal varies over time at a low frequency of between 1 and 250 Hz, and an additional high frequency magnetic signal at a frequency of between 1 and 20 kHz is also imposed by said reading assembly.

17. A system according to any of Claims 10 to 16, wherein said reading assembly is adapted to apply said magnetic bias signal to magnetic elements in said spatial distribution sequentially.

18. A system according to any of Claims 10 to 16, wherein said reading assembly is adapted to apply said magnetic bias signal to magnetic elements in said spatial distribution in parallel.

19. A system according to any of Claim 12, further comprising a writing assembly adapted to change the permanent magnetisation of at least one magnetic element of said spatial distribution simultaneously with or after reading of at least one or more magnetic elements in said spatial distribution, thereby providing an indication, if the article is subsequently read again, that the said article had been previously read.

20. Apparatus comprising a first part that receives selected second parts in mating or interlocking relation therewith, the apparatus being provided with means preventing inadvertent re-use of second parts previously used, wherein the said means comprises a system according to Claim 19, in which the said reading and writing assemblies are mounted on the first part, and each second part comprises an article according to Claim 1 or to any of Claims 3 to 5 or 9 as appendent to Claim 1.

21. Apparatus according to Claim 20, wherein the first and second parts form a tubular connector and the second part comprises an article according to Claim 4.

22. A method of encoding a plurality of articles, wherein each such article is provided with a spatial distribution of passive magnetic elements, each such magnetic element comprising a layer of soft magnetic material characterised by high permeability, low coercivity and a non-linear B-H characteristic, and formed as a discrete region of such material, and each such magnetic element

having at least one second layer of magnetic material capable of being permanently magnetised at least in a region adjacent said first layer to provide a magnetic bias for the said magnetic element; the spatial distribution of magnetic elements and/or the bias of individual said magnetic elements in said spatial distribution being varied from one said article to another to provide said encoding.

23. A method for correct registration of a first part with a second part; the method comprising: providing the first part with a spatial distribution of passive magnetic elements, each such magnetic element comprising a layer of soft magnetic material characterised by high permeability, low coercivity and a non-linear B-H characteristic, and formed as a discrete region of such material, and each such magnetic element having a second layer of magnetic material capable of being permanently magnetised at least in a region adjacent said first layer to provide a magnetic bias for the said magnetic element; providing the second part with a reading assembly for said magnetic elements, the reading assembly comprising means adapted to apply a magnetic bias signal that varies over time and means adapted to detect when the said bias signal approximates the said magnetic bias provided by the second layer of a said magnetic element, and being provided in the form of a spatial array of reading sub-assemblies, the distribution of sub-assemblies in said array corresponding to the said spatial distribution of magnetic elements, and each such sub-assembly being adapted for localised reading of an associated magnetic element while being substantially insensitive to other magnetic elements of the spatial distribution; and adjusting the position of said first part relative to said second part until each of said sub-assemblies indicates the presence of its associated magnetic element.

24. A method for preventing re-use of a disposable part adapted for mating or interlocking with a second part, the method comprising providing each of said disposable parts with a spatial distribution of passive magnetic elements,

each such magnetic element comprising a layer of soft magnetic material characterised by high permeability, low coercivity and a non-linear B-H characteristic, and formed as a discrete region of such material, and each such magnetic element having at least one second layer of magnetic material capable of being permanently magnetised at least in a region adjacent said first layer to provide a magnetic bias for the said magnetic element; providing the second part with a reading assembly for said magnetic elements, the reading assembly comprising means adapted to apply a magnetic bias signal that varies over time and means adapted to detect when the said bias signal approximates the said magnetic bias provided by the second layer of a said magnetic element, and being provided in the form of a spatial array of reading sub-assemblies, the distribution of sub-assemblies in said array corresponding to the said spatial distribution of magnetic elements, and each such sub-assembly being adapted for localised reading of an associated magnetic element while being substantially insensitive to other magnetic elements of the spatial distribution; and adjusting the position of said first part relative to said second part until each of said sub-assemblies indicates the presence of its associated magnetic element; providing the second part with a writing assembly adapted to change the permanent magnetisation of at least one magnetic element of said spatial distribution simultaneously with or after reading of at least one or more magnetic elements in said spatial distribution, thereby providing an indication, if the second part is subsequently read again, that the said second part had been previously read.